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⑭考案の名称　電磁継電器

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㊺参考文献　特開　昭57－107013（JP，A）　特公　昭34－6774（JP，B1）

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㊼実用新案登録請求の範囲

鉄心及び接極子よりなる磁気回路と該回路を励磁して鉄心の一方の端面に接極子の対向面を磁気吸引させる直流電流を流す前記鉄心に巻装したコイルとを具え、該コイルに所要の電流を流すことにより動作し、該電流の停止により復帰する電磁継電器において、

該コイルに流す電流の方向を一方向として、前記磁気回路の磁化方向を一定にし、鉄心の一部には該磁化方向に一致する極性を有する永久磁石を前記鉄心が分断されないように埋没してなることを特徴とする電磁継電器。

考案の詳細な説明

本考案は電磁継電器、特に感動電流を少さくし動作電力を低減せしめる構造的改良を施し、低電力で且つ小型化可能な電磁継電器に関する。

電気接点を開閉させることにより、同一若しくは他の電気回路に接続された装置を作動又は制御する電磁継電器は、磁気回路と電磁コイルと接点ばね組み等にて構成され、コイルに所定電流を流す又は該電流を断つことにより、接極子を所定量だけ揺動させて接点接続の切替えが行なわれ、その機能を果すようになる。第1図は一般的な前記電磁電器の磁気回路に電磁コイルを装着した側面図であり、それぞれ磁性材にてなる棒状鉄心1と側面視L字形に折曲した継鉄2及び接極子3とで磁気回路を構成し、ボビン4に巻装したコイル5は、一端を継鉄2に固着した鉄心1に嵌装されている。ただし押えばね6は、継鉄2の鉄心1と平行する先端部に接極子3の折曲内側コーナ部を押圧させるとともに、コイル5に電流を流さないときの鉄心磁極面1′と接極子対向面3′とを常時開離させる押圧源体として装着されている。

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従つて、コイル5に所定電流を流し前記磁気回路を励磁させると、押えばね6の押圧力に強る磁気吸引力が鉄心磁極面1′と接極子対向面3′との間に発生する。その結果、接極子3はその折曲部を軸として回動し、対向面3′が磁極面1′に接するようになる。次いで、前記電流を断つと前記磁気吸引力が解消するため、接極子3は押えばね6の弾性復帰力により元の姿態に戻されるようになる。

即ち、従来の電磁継電器は電磁コイルに通電して形成された磁気力のみにより、動作するようにされていた。

本考案の目的は上記動作させる所要電流を低めることであり、この目的は、コイルに流す直流電流の方向を一方向として、磁気回路の磁化方向を一定にし、鉄心の一部にはその磁化方向に一致する極性を有する永久磁石を鉄心を分断されないようにして埋没して配設し、永久磁石の磁気力とコイルに通電して形成された磁気力との合成磁気力により動作するように構成してなることを特徴とした電磁継電器を提供して達成される。

以下、本考案の実施例に係わる図面を用いて本考案を説明する。

第2図は本考案の一実施例に係わる電磁継電器の磁気回路とコイルを示す側面図、第3図は前記磁気回路を構成する鉄心に埋設した永久磁石の磁束説明図、第4図は本考案の他の一実施例に係わる電磁継電器の磁気回路とコイルを示す側面図である。なお、図中において前出図と共通可能部分には同一符号を用い、その結果は省略する。

第2図において、磁気回路は一部に永久磁石7を埋設した磁性材にてなる棒状鉄心8と、継鉄2及び接極子3とからなり、鉄心8にはボビン4に巻装したコイル9が嵌装され、接極子3の対向面3′は押えばね6の押圧力により鉄心8の磁極面8′と所定間隙だけ隔てて対向するようにしてある。ただし、所望の磁気力（例えば継電器を動作させるのに必要な磁気力の約30%）を有する永久磁石7は、その極性（N，S）がコイル9に所定電流を流して形成される磁束方向と一致するようにし、かつ、鉄心8を分断及び鉄心磁極面8′に露呈しない鉄心中央部に埋設されている。

従つて第3図aに示す如く、コイル9に電流を流さないときは永久磁石7の磁束Aが鉄心8内を通つて短絡し、鉄心磁極面8′より磁束を殆ど発生させない。そのため、磁極面8′と接極子対向面3′とは押えばね6の押圧力により開離された状態を維持するようになる。

一方第3図bに示す如く、コイル9に電流を流すとその電流によつて形成される磁気力と、永久磁石7の有する磁気力との合成磁束Bを発生する磁極面8′は、接極子対向面3′を吸引して該電磁継電器が動作状態になる。そして前記電流を断つと、合成磁束Bが解消して永久磁石7の磁束は第3図aに示す如くなるため、接極子3は押えばね6の弾性復帰力により元の姿態に戻される。

従つて、第2図に示した電磁コイル9に動作のために流すべき所要電流I－1は、第1図に示した電磁コイル5に動作のために流すべき所要電流I－2より小さくすることができる。

第4図において、磁気回路は一部に永久磁石10を埋設した磁性材にてなる棒状鉄心11と、継鉄2及び接極子3とからなり、鉄心11にはボビン4に巻装したコイル12が嵌挿し、接極子3を継鉄2に係合させる押えばね6が装着されている。

ただし、所望の磁気力を有する永久磁石10は、その極性（N，S）がコイル12に所定電流を流して形成される磁束方向と一致し、かつ、鉄心磁極面11′のやや内側から継鉄2との接合端に至る大形のものが埋設されている。従つて、永久磁石10は第2図に示した永久磁石7より磁気力が強いため、コイル12に流すべき所要電流I－3は前記電流I－1よりもさらに小さくすることができる。

なお、鉄心に永久磁石を埋設するには、鉄心に所望の溝又は切欠きを形成し、該溝又は切欠きを埋めるようにして永久磁石を嵌挿して得られる。また、構成上コイル電流しや断時の磁束短絡効果は減少するが、接極子吸引力を増すため永久磁石を鉄心磁極面まで延して配置することもよい。

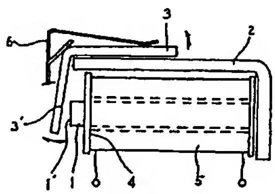
以上説明した如く本考案によれば、電磁コイルに流すべき感動電力を25%程度低減させることも容易となる。従つて、新しいタイプの低消費型電磁継電器を実現せしめたのみならず、電力低減に代つて電磁コイルを小形化することによつて、小型・軽量電磁継電器をも実現せしめ得た実用的効果は極めて大きい。

図面の簡単な説明

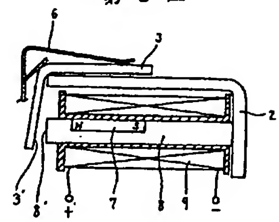
第1図は一般的な電磁継電器の磁気回路に電磁コイルを装着した側面図、第2図は本考案の一実施例に係わる電磁継電器の磁気回路に電磁コイルを装着した側面図、第3図は第2図に示した磁気回路を構成する鉄心に埋設した永久磁石の磁束説明図、第4図は本考案の他の一実施例に係わる電磁継電器の磁気回路に電磁コイルを装着した側面図である。

なお、図中において1，8，11は鉄心、1′，8′は鉄心磁極面、2は継鉄、3は接極子、3′は鉄心磁極面に対向する接極子の対向面、4はボビン、5，9，12は電磁コイル、7，10は永久磁石、A，Bは磁束を示す。

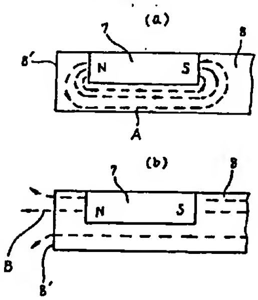
第1図



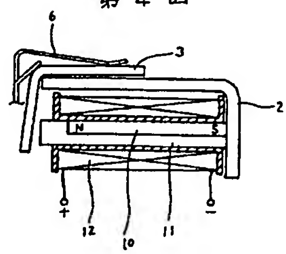
第2図



第3図



第4図



Date: September 10, 2003

Declaration

I, Michihiko Matsuba, President of Fukuyama Sangyo Honyaku Center, Ltd., of 16-3, 2-chome, Nogami-cho, Fukuyama, Japan, do solemnly and sincerely declare that I understand well both the Japanese and English languages and that the attached document in English is a full and faithful translation, of the copy of Japanese Utility Model Publication No. Sho-63-44930 published on November 22, 1988.

M. Matsuba

Michihiko Matsuba

Fukuyama Sangyo Honyaku Center, Ltd.

ELECTROMAGNETIC RELAY

Japanese Utility Model Publication No. Sho-63-44930

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Filed on: March 20, 1981

Inventor: Hirotsugu HANADA, et. al.

Applicant: Fujitsu Corporation

Patent Attorney: Koshiro MATSUOKA

SPECIFICATION

TITLE OF THE UTILITY MODEL

ELECTROMAGNETIC RELAY

WHAT IS CLAIMED IS:

An electromagnetic relay including a magnetic circuit consisting of an iron core and a contactor, and a coil, which is wound around said iron core, for flowing a direct current that magnetically adsorbs the opposing face of said contactor to one end face of said iron core by exciting said circuit, which operates by causing a prescribed current to flow to said coil and is reset by stopping said current;

wherein the magnetization direction of said magnetic circuit is made constant by making the direction of a current

flowing into said coil into one direction, and a permanent magnet having a polarity coincident with said magnetization direction is built in a part of the iron core so that said iron core is not separated.

DETAILED DESCRIPTION OF THE UTILITY MODEL

The present utility mode relates to an electromagnetic relay, and in particular to an electromagnetic relay, to which structural improvement is applied by which the emotion current is decreased and operating power is lowered, and which is sufficient with low power and can be made small in size.

An electromagnetic relay that, by opening and closing an electric contact, operates or controls an apparatus which is connected to the same or another electric circuit is composed of a magnetic circuit, an electromagnetic coil and a set of contact springs, etc., wherein, by flowing or interrupting a prescribed current to a coil, a contact connection is changed over by moving or rocking a contactor by a prescribed amount, thereby achieving the function thereof. Fig. 1 is a side elevational view showing a state where an electromagnetic coil is mounted in a magnetic circuit of said general electromagnetic relay device, wherein the magnetic circuit is composed of a rod-shaped iron core 1, a yoke 2 formed to be L-shaped in its side view and a contactor 3 formed to be L-shaped

in its side view, which are, respectively, made of a magnetic material, and a coil 5 wound in a bobbin 4 is fitted to the iron core 1 whose one end is fixed at the yoke 2. However, a pressing spring 6 presses the inside folded corner portion of the contactor 3 to the tip end portion parallel to the iron core 1 of the yoke 2, and at the same time, is mounted as a pressing source member by which the magnetic face 1′ of the iron core and the opposing face 3′ of the contactor are always separated to be open when no current is provided to the coil 5.

Therefore, if a prescribed current is caused to flow into the coil 5 to excite the above-described magnetic circuit, an electromagnetic absorption force operating on the pressing force of the pressing spring 6 is generated between the magnetic face 1′ of the iron core and the opposing face 3′ of the contactor. Resultantly, the contactor 3 begins to rotate in a state where the folded portion is used as an axis, and the opposing face 3′ is brought into contact with the magnetic face 1′. Next, since the above-described magnetic absorption force is cancelled by interrupting the above-described current, the contactor 3 is returned to the original state by a resilient restoration force of the pressing spring 6.

That is, a prior art electromagnetic relay is devised

so as to operate by only a magnetic force formed by causing a current to flow into its electromagnetic coil.

It is therefore an object of the utility model to lower the prescribed current required for the above-described operation. The object is achieved by providing an electromagnetic relay that is actuated with a synthetic magnetic force of the magnetic force of a permanent magnet and a magnetic force formed by causing a current to flow into the coil in a state where the magnetization direction of said magnetic circuit is made constant by making the direction of a current flowing into said coil into one direction, and a permanent magnet having a polarity coincident with said magnetization direction is built in a part of the iron core so that said iron core is not separated.

Hereinafter, a description is given of the present utility model with reference to the drawings pertaining to the embodiments of the present utility model.

Fig. 2 is a side elevational view showing a magnetic circuit and a coil of an electromagnetic relay according to one embodiment of the present utility model, Fig. 3 is a view describing magnetic fluxes of a permanent magnet built in the iron core composing the above-described magnetic circuit, and Fig. 4 is a side elevational view showing a magnetic circuit

and a coil of an electromagnetic relay according to another embodiment of the present utility model. Parts that are common to those in the drawings referred to in the above are given the same reference numbers, and the results thereof are omitted.

In Fig. 2, the magnetic circuit is composed of a rod-shaped iron core 8 having a permanent magnet 7 built in a part thereof and made of a magnetic material, a yoke 2 and a contactor 3. A coil 9 that is wound around a bobbin 4 is fitted to the iron core 8, and the opposing face 3′ of the contactor 3 is opposed, with prescribed clearance, to the magnetic face 8′ of the iron core 8 by a pressing force of a pressing spring 6. However, the permanent magnet 7 having a prescribed magnetic force (for example, approx. 30% of the magnetic force necessary to operate the relay) has its polarities (N and S) coincident with the magnetization direction formed by causing a prescribed current to flow into the coil 9, and is built in the middle part of the iron core so that it does not separate the iron core 8 and is not exposed to the outside from the magnetic faces 8′ thereof.

Therefore, as shown in Fig. 3(a), when no current is permitted to flow into the coil 9, the magnetic flux A of the permanent magnet 7 passes through the iron core 8 and is

short-circuited, wherein almost no magnetic flux is generated from the magnetic face 8′ of the iron core. Therefore, the magnetic face 8′ and the opposing face 3′ of the contactor are maintained to be spaced from each other by the pressing force of the pressing spring 6.

On the other hand, as shown in Fig. 3(b), the magnetic face 8′ that generates a synthetic magnetic flux B of the magnetic force formed by the current flowing into the coil 9 and the magnetic force brought about by the permanent magnet 7 absorbs the opposing face 3′ of the contactor and causes the corresponding electromagnetic relay to operate. And, since, by interrupting the above-described current, the synthetic magnetic flux B is caused to disappear and the magnetic flux of the permanent magnet 7 becomes as shown in Fig. 3(a), the contactor 3 is returned to its original state by the resilient restoration force of the pressing spring 6.

Accordingly, the current I-1 required to flow into the electromagnetic coil 9 for its operation can be made lower than the current I-2 required to flow into the electromagnetic coil 5 shown in Fig. 1 for its operation.

In Fig. 4, the magnetic circuit is composed of a rod-shaped iron core 11 having a permanent magnet 10 built in a part thereof and made of a magnetic material, and a yoke 2

and a contactor 3, and a coil 12 that is wound around the bobbin 4 is fitted to an iron core 11, and the pressing spring 6 by which the contactor 3 is engaged with the yoke 2 is mounted therein.

However, the permanent magnet 10 having a prescribed magnetic force has its polarities (N, S) coincident with the magnetization direction formed by causing a prescribed current to flow into the coil 12, which is large-sized so as to reach the connection end with the yoke 2 almost from the inside of the magnetic face 11′ of the iron core, is built in the iron core 11. Therefore, since the permanent magnet 10 has a further intensive magnetic force than that of the permanent magnet 7 shown in Fig. 2, the current I-3 required to flow into the coil 12 can be made still lower than that of the above-described current I-1.

In addition, when incorporating the permanent magnet in the iron core, a prescribed groove or notch is formed in the iron core, wherein the permanent magnet is fitted into the groove or notch so that the magnet fills up the groove or notch. Also, although the magnetic flux short-circuiting effect is decreased due to a structural feature when interrupting the coil current, the permanent magnet may be disposed so as to extend to the magnetic face of the iron core in order to increase

the absorption force of the contactor.

As described above, according to the present utility model, it becomes possible to reduce the emotion current, which is caused to flow into the electromagnetic coil, by approx. 25%. Therefore, not only can a novel type of low-power consumption electromagnetic relay be brought about, but also a small-sized and light-weighted electromagnetic relay can be achieved by making the electromagnetic coil small instead of reducing the power, wherein practical effects thereof are remarkably large.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a side elevational view showing a state where an electromagnetic coil is mounted in a magnetic circuit of said general electromagnetic relay; Fig. 2 is a side elevational view showing a magnetic circuit and a coil of an electromagnetic relay according to one embodiment of the present utility model; Fig. 3 is a view describing magnetic fluxes of a permanent magnet built in the iron core composing the magnetic circuit shown in Fig. 2; and Fig. 4 is a side elevational view showing a magnetic circuit and a coil of an electromagnetic relay according to another embodiment of the present utility model.

Also, in the drawings, reference numbers 1, 8 and 11

denote iron cores, 1′ and 8′ denote the magnetic faces of the iron cores, 2 denotes a yoke, 3 denotes a contactor, 3′ denotes the opposing face of the contactor opposed to the magnetic face of the iron core, 4 denotes a bobbin, 5, 9 and 12 denote electromagnetic coils, 7 and 10 denote permanent magnets, A and B denote magnetic fluxes.

Fig. 1

Fig. 2

Fig. 3(a)

Fig. 3(b)

Fig. 4

Fig.1

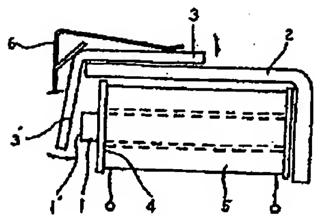

Fig.2

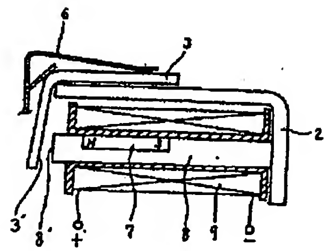

Fig.3

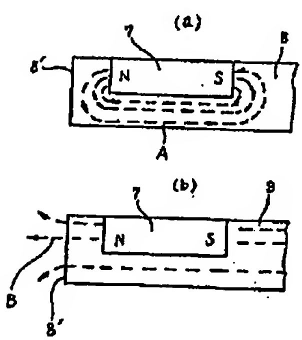

Fig.4